

PROVISIONAL SUN-SPOT RELATIVE NUMBERS FOR
JANUARY, 1928

[Data furnished by Prof. A. Wolfer, Zurich, Switzerland]

January	Relative numbers	January	Relative numbers	January	Relative numbers
1.....	68	11.....	79	21.....	70
2.....		12.....	78	22.....	52
3.....		13.....	54	23.....	61
4.....	80	14.....	61	24.....	94
5.....		15.....	62	25.....	116
6.....		16.....		26.....	113
7.....	83	17.....	75	27.....	143
8.....	93	18.....	62	28.....	94
9.....		19.....		29.....	89
10.....	80	20.....	55	30.....	69
				31.....	

Number of observations, 23; mean, 79.2.

FINAL SMOOTHED VALUES OF THE SUNSPOT RELATIVE
NUMBERS FOR 1926¹[Figures taken from *Astronomische Mitteilungen*, Zurich, September, 1927, p. 183]

Month	Number	Month	Number
January.....	71.8	August.....	61.6
February.....	70.0	September.....	60.8
March.....	62.5	October.....	71.5
April.....	38.5	November.....	60.5
May.....	64.3	December.....	79.4
June.....	73.5		
July.....	52.3	Year.....	63.9

¹ These figures replace the provisional values published in the MONTHLY WEATHER REVIEW, July, 1926 (p. 300), and January, 1927 (p. 30).

AEROLOGICAL OBSERVATIONS

By L. T. SAMUELS

Free-air temperatures were mostly above normal at the aerological stations, with the greatest departures occurring at Ellendale and Washington. (See Table 1.) The departures at both of these stations decreased with altitude, with the exception of the 500-meter and 750-meter levels. The fact that only a single observation at Ellendale reached to 4,000 meters explains the large departures found at and above that level.

Relative humidity departures were nearly all negative, whereas those for vapor pressure were about equally divided in sign.

Free-air resultant-wind directions were close to normal, but the velocities were considerably above normal. (See Table 2.)

Surface and upper-air maximum temperature records were exceeded at several stations on the 14th, when an extensive low-pressure area was centered over the middle of the country. Record temperatures occurred at the surface, 1,250 meters and 1,500 meters above Broken Arrow; at 3,500 meters and 4,000 meters above Due West; at the surface, 250 meters, 500 meters, and 3,500 meters above Groesbeck; at the surface, 1,000 meters, 2,000 meters, and 2,500 meters above Royal Center.

A 54 m. p. s. wind from the northwest was observed at 9,500 meters above Groesbeck on the morning of the 2d. This was well substantiated by a nephoscope observation on cirrus clouds made during the afternoon of that day which indicated a velocity of 55 m. p. s. At this time there was a latitudinal surface temperature gradient of 25° C. between this station and the northern part of the United States. On the 5th when the latitudinal surface temperature gradient over this same region was practically zero the winds over Groesbeck averaged 4 meters per second and did not exceed 10 meters per second to at least 10,000 meters.

Examples of pronounced surface-temperature inversions are shown by the kite records of Due West and Broken Arrow on the 6th and 11th, respectively. At the former station the temperature rose 12.7° C. throughout the first 150 meters, and at Broken Arrow the temperature at 390 meters was 16.4° C., while at the surface it was 5.0° C. Both of these observations were made near the center of an anticyclone where conditions were favorable for intense nocturnal radiation.

TABLE 1.—Free-air temperatures, relative humidities, and vapor pressures during January, 1928

TEMPERATURE (°C.)												
Altitude (meters) m. s. l.	Broken Arrow, Okla. (233 meters)		Due West, S. C. (217 meters)		Ellendale, N. Dak. (444 meters)		Groesbeck, Tex. (141 meters)		Royal Center, Ind. (225 meters)		Washington, D. C. (7 meters) ¹	
	Mean	De- parture from 10- year mean	Mean	De- parture from 7- year mean	Mean	De- parture from 11- year mean	Mean	De- parture from 10- year mean	Mean	De- parture from 10- year mean	Mean	De- parture from 3- year mean
Surface..	3.8	+0.3	5.2	-0.6	-8.4	+2.2	9.2	+1.2	-4.5	-0.6	3.3	+3.8
250.....	3.8	+0.3	5.1	-0.6			9.2	+1.4	-4.7	-0.6	2.5	+3.2
500.....	3.9	+0.7	5.7	+0.4	-8.0	+2.5	9.1	+1.6	-5.5	-0.5	2.5	+3.5
750.....	3.3	+0.3	5.5	+0.6	-6.1	+3.5	8.6	+1.2	-5.1	0.0	2.2	+3.6
1,000.....	3.1	0.0	4.7	+0.4	-5.4	+2.8	7.8	+0.4	-5.0	0.0	1.0	+3.1
1,250.....	2.9	-0.2	4.1	+0.5	-5.7	+1.7	7.5	+0.4	-5.3	-0.2	-0.1	+2.6
1,500.....	2.5	-0.3	3.2	+0.4	-6.3	+1.2	6.4	-0.1	-6.2	-0.7	-1.2	+2.1
2,000.....	0.9	-0.5	1.3	+0.4	-8.5	-0.6	4.2	-0.6	-7.4	-0.8	-3.6	+1.2
2,500.....	-1.1	-0.2	-1.1	0.0	-10.7	+0.6	2.4	-0.3	-8.9	-0.4	-5.9	+0.8
3,000.....	-3.7	-0.3	-2.8	+0.5	-13.2	-0.7	-0.1	-0.5	-11.3	-0.5	-9.4	+0.6
3,500.....	-6.5	-0.5	-4.6	+0.9	-16.2	-0.5	-2.7	-0.3	-13.7	-0.4	-11.8	-0.6
4,000.....	-9.1	-0.3	-5.9	+2.5	-17.3	+2.0	-4.7	-0.4	-16.1	-1.3		
4,500.....			-7.4	+3.6	-18.7	+3.3	-6.8	-1.1	-19.0	-1.6		
RELATIVE HUMIDITY (%)												
Surface..	61	-9	66	-1	74	-7	70	-7	79	0	59	-8
250.....	61	-9	65	-1			67	-8	79	0	58	-6
500.....	54	-10	59	-2	71	-8	61	-10	76	+1	55	-5
750.....	52	-8	56	-2	60	-12	66	-11	68	-2	53	-5
1,000.....	50	-5	53	-3	56	-9	52	-10	60	-5	53	-5
1,250.....	48	-3	51	-3	55	-5	47	-10	56	-4	54	-4
1,500.....	45	-2	50	-2	52	-6	46	-7	55	-2	56	-1
2,000.....	41	-1	50	+2	50	-7	43	-5	47	-5	58	+2
2,500.....	40	-1	52	+8	48	-9	39	-6	47	-5	58	+4
3,000.....	35	-6	43	+3	47	-10	37	-5	40	-13	57	+2
3,500.....	38	-4	37	0	53	-2	33	-7	34	-21	42	+2
4,000.....	30	-13	34	-5	47	-6	27	-11	31	-23		
4,500.....			32	-6	47	-9	26	-11	30	-22		
VAPOR PRESSURE (Mb)												
Surface..	5.26	-0.53	6.69	-0.05	2.86	+0.37	9.17	+0.32	4.16	+0.24	5.15	+0.83
250.....	5.23	-0.52	6.65	-0.01			8.76	+0.26	4.11	+0.27	4.84	+0.70
500.....	4.75	-0.40	6.43	+0.32	2.79	+0.35	7.80	-0.02	3.83	+0.43	4.64	+0.70
750.....	4.34	-0.33	6.06	+0.32	2.54	+0.28	6.93	-0.29	3.46	+0.35	4.43	+0.66
1,000.....	4.05	-0.18	5.49	+0.13	2.37	+0.15	6.02	-0.50	3.02	+0.17	4.12	+0.59
1,250.....	3.74	-0.07	5.06	+0.17	2.25	+0.10	5.14	-0.69	2.71	+0.12	3.79	+0.50
1,500.....	3.40	0.00	4.61	+0.27	2.04	+0.02	4.55	-0.65	2.37	+0.02	3.63	+0.53
2,000.....	2.74	-0.02	3.89	+0.39	1.70	-0.04	3.48	-0.65	1.90	-0.03	3.05	+0.42
2,500.....	2.38	+0.05	3.30	+0.66	1.33	-0.09	2.45	-0.86	1.40	-0.24	2.33	+0.20
3,000.....	1.85	-0.13	2.46	+0.47	1.02	-0.08	1.67	-0.94	1.01	-0.41	1.72	-0.09
3,500.....	1.63	-0.08	1.30	-0.13	0.91	+0.11	0.88	-1.18	0.84	-0.40	1.02	-0.09
4,000.....	1.08	-0.36	0.96	-0.24	0.66	+0.27	0.26	-1.41	0.16	-0.80		
4,500.....			0.66	-0.35	0.84	+0.25	0.13	-1.30				

¹ Naval Air Station, Anacostia, D. C.

TABLE 2.—Free-air resultant winds (m. p. s.) during January, 1928

Altitude (meters) m. s. l.	Broken Arrow, Okla. (233 meters)				Due West, S. C. (217 meters)				Ellendale, N. Dak. (444 meters)				Groesbeck, Tex. (141 meters)				Royal Center, Ind. (225 meters)				Washington, D. C. (34 meters)			
	Mean		10-year mean		Mean		7-year mean		Mean		11-year mean		Mean		10-year mean		Mean		10-year mean		Mean		8-year mean	
	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.
Surface.....	S. 43 W.	2.0	S. 48 W.	1.2	S. 87 W.	3.7	N. 78 W.	1.5	N. 72 W.	5.0	N. 65 W.	3.1	S. 20 W.	1.5	W.	0.5	S. 67 W.	4.6	S. 54 W.	2.2	N. 71 W.	2.0	N. 42 W.	1.5
250.....	S. 42 W.	2.3	S. 43 W.	1.3	S. 86 W.	4.1	N. 83 W.	1.7	N. 72 W.	5.0	N. 65 W.	3.1	S. 18 W.	2.5	S. 81 W.	0.7	S. 64 W.	5.2	S. 53 W.	2.6	N. 81 W.	6.1	N. 69 W.	3.7
500.....	S. 50 W.	4.7	S. 39 W.	2.6	S. 86 W.	6.9	S. 88 W.	3.2	N. 68 W.	6.1	N. 69 W.	3.7	S. 37 W.	3.4	S. 66 W.	1.9	S. 68 W.	9.8	S. 61 W.	5.4	N. 81 W.	8.0	N. 73 W.	6.1
750.....	S. 61 W.	5.4	S. 45 W.	3.2	S. 86 W.	9.1	S. 85 W.	4.8	N. 68 W.	9.3	N. 65 W.	5.8	S. 43 W.	4.1	S. 57 W.	3.0	S. 80 W.	12.3	S. 70 W.	7.1	N. 79 W.	9.4	N. 72 W.	7.8
1,000.....	S. 77 W.	6.0	S. 61 W.	3.9	S. 86 W.	10.1	S. 83 W.	6.1	N. 56 W.	10.4	N. 63 W.	7.0	S. 41 W.	4.4	S. 61 W.	3.7	S. 88 W.	12.8	S. 78 W.	8.1	N. 78 W.	10.4	N. 69 W.	8.1
1,250.....	S. 80 W.	6.3	S. 72 W.	4.4	N. 89 W.	11.8	S. 83 W.	8.3	N. 57 W.	11.1	N. 62 W.	8.0	S. 51 W.	5.2	S. 68 W.	4.5	N. 88 W.	13.5	S. 83 W.	9.1	N. 76 W.	12.5	N. 70 W.	10.5
1,500.....	S. 83 W.	7.3	S. 75 W.	5.5	N. 88 W.	13.3	S. 83 W.	10.5	N. 57 W.	12.1	N. 63 W.	8.5	S. 55 W.	7.3	S. 71 W.	6.0	N. 88 W.	14.3	S. 86 W.	10.3	N. 78 W.	13.8	N. 73 W.	11.8
2,000.....	N. 89 W.	9.7	S. 84 W.	7.6	N. 84 W.	14.1	S. 89 W.	12.8	N. 54 W.	14.4	N. 64 W.	11.1	S. 67 W.	7.6	S. 78 W.	7.2	N. 87 W.	16.7	S. 86 W.	12.1	N. 78 W.	16.0	N. 80 W.	14.2
2,500.....	N. 72 W.	10.9	W.	9.0	N. 87 W.	14.4	W.	15.1	N. 55 W.	15.8	N. 65 W.	13.1	S. 66 W.	8.0	S. 80 W.	8.5	S. 88 W.	17.8	W.	14.2	N. 78 W.	18.5	N. 81 W.	15.4
3,000.....	N. 67 W.	10.7	N. 87 W.	10.2	N. 85 W.	15.6	S. 83 W.	16.4	N. 49 W.	17.0	N. 65 W.	14.6	S. 74 W.	8.9	S. 81 W.	9.9	N. 83 W.	17.6	W.	13.7	N. 78 W.	18.5	N. 81 W.	15.4
3,500.....	N. 66 W.	11.0	N. 84 W.	10.9	N. 84 W.	17.2	S. 86 W.	16.3	N. 48 W.	18.4	N. 66 W.	15.6	S. 82 W.	10.4	S. 83 W.	11.2	N. 72 W.	15.1	S. 85 W.	13.4	N. 71 W.	15.0	N. 78 W.	17.0
4,000.....	N. 62 W.	9.2	N. 83 W.	10.9	N. 70 W.	14.9	S. 87 W.	15.5	N. 35 W.	18.0	N. 62 W.	18.9	N. 88 W.	10.2	S. 74 W.	12.1	N. 57 W.	13.7	S. 81 W.	15.9	N. 79 W.	17.0	N. 82 W.	18.2
4,500.....	N. 22 W.	12.0	N. 85 W.	10.6	N. 45 W.	15.0	N. 73 W.	14.6	N. 22 W.	18.0	N. 54 W.	19.0	W.	13.0	S. 74 W.	14.2	N. 69 W.	17.2	S. 88 W.	18.4	N. 76 W.	19.3	N. 77 W.	17.3
5,000.....					N. 45 W.	13.0	N. 54 W.	16.2									N. 45 W.	23.0	N. 45 W.	23.0	N. 74 W.	19.2	N. 81 W.	19.3

THE WEATHER ELEMENTS

By P. C. DAY

GENERAL CONDITIONS

The important features of the weather during January, 1928, were the strong cold wave existing during the first few days over the districts from the plateau region eastward, and the widespread deficiency in the amounts of precipitation as compared with the normals for the month over practically all parts of the country.

PRESSURE AND WINDS

As the month opened a strong anticyclone, attended by severe cold, that had entered the northwestern United States near the close of 1927 had advanced into the Great Plains with center of highest pressure, nearly 31 inches, over the Dakotas and eastern Montana. At the same time a cyclone of considerable importance was passing down the St. Lawrence Valley, and conditions favored clear and cold weather over the entire country from the Rocky Mountains eastward.

As the anticyclone moved eastward and southward during the following day or two sharp changes to colder weather occurred, the falls from 8 a. m., December 31, to 8 a. m., January 1, ranging from 20° to 50° or more over a wide area from the Middle and East Gulf and South Atlantic States northward to the Ohio Valley and lower Lake region, the surface temperatures at the same time ranging from nearly 50° below zero in Montana to 60° above in southern Florida.

During the following day or two the anticyclone gradually extended southeastward, and temperatures continued to fall over the Gulf and South Atlantic States, the severest cold over portions of southern Florida occurring on the mornings of the 3d and 4th, at which times temperatures below freezing extended into and even south of the Everglades.

While the extreme low temperatures in Florida and near-by areas during this period were slightly higher than on some other occasions, still the effect of the cold was greatly augmented by the long periods during which the temperature continued constantly below the freezing point. In some instances this covered a greater number of hours than was the case during the severe cold of February, 1899.

Though unusual cold prevailed at this time over much of the far Northwest and in the more southern districts from the Great Plains eastward, the cold was not unusually severe over the northeastern districts.

A prompt rise in temperature followed the anticyclone referred to above, and moderate winter weather prevailed over most districts until the middle of the month, some unusually high temperatures for midwinter occurring in the lower Missouri and middle Mississippi Valleys about the 10th.

No important cyclone crossed the country during the first half of the month, though considerable precipitation occurred near the end of the first decade over the Southeastern and Atlantic Coast States, and about the 14th and 15th from the upper Mississippi Valley eastward to New England.

A sharp fall in temperature occurred over the more northern States from the Dakotas eastward on the 15th and 16th, but warmer weather quickly followed, continuing until the end of the second decade, when an important anticyclone again entered the Northwest and quickly overspread the country from the Rocky Mountains eastward, bringing sharp falls in temperature and carrying the frost line again into the coast districts of the East Gulf and South Atlantic States. Slightly preceding this cold wave a cyclone of moderate strength moved from the middle Plains to the upper Lake region and thence to the St. Lawrence Valley, causing during the 19th and 20th rather widespread, but mostly light precipitation from the Mississippi Valley eastward.

The early part of the third decade was without important weather changes, though on the 24th a well-defined cyclone was central near southern Missouri, which moved rapidly to the northeastward and was central on the morning of the 25th as a storm of considerable severity over northern New England. It was attended by widespread and moderately heavy precipitation from the Mississippi River eastward, mostly rain, though some snow occurred in the Ohio Valley and Great Lakes region.

An important anticyclone developed over the middle plateau on the morning of the 27th and gradually moved southeastward, reaching the vicinity of Florida on the morning of the 29th, when unusually low temperatures occurred over the southern portions of that State. While temperatures over the Southeastern States were mainly considerably higher at this time than occurred during the cold wave earlier in the month, yet in the more southern portions of Florida the minimum temperatures on the 29th in the districts to the southeast of Lake Okeechobee were from 3° to 5° or more lower than on the previous occasion. Concerning these conditions, the official in charge at Jacksonville states that some of the